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54 **Mirror Assembly.**

57 A mirror assembly for the wind of a road vehicle is provided which enables a driver more readily to see around a vehicle being towed.

In one embodiment, the mirror (18) is mounted on the housing (6) for movement between two positions, a first being a normal position, a second being an extended position. The mirror may be moved between said to positions by swinging outward

movement, or linear sliding movement.

In another embodiment a mirror assembly comprises a housing (8) comprising a recess (58) which may be snap-fitted onto an existing wing mirror, and an outer part of the assembly carries a supplementary mirror which is capable of providing the driver with extended lateral visibility. The housing may be of one-part construction, or of two-part construction.

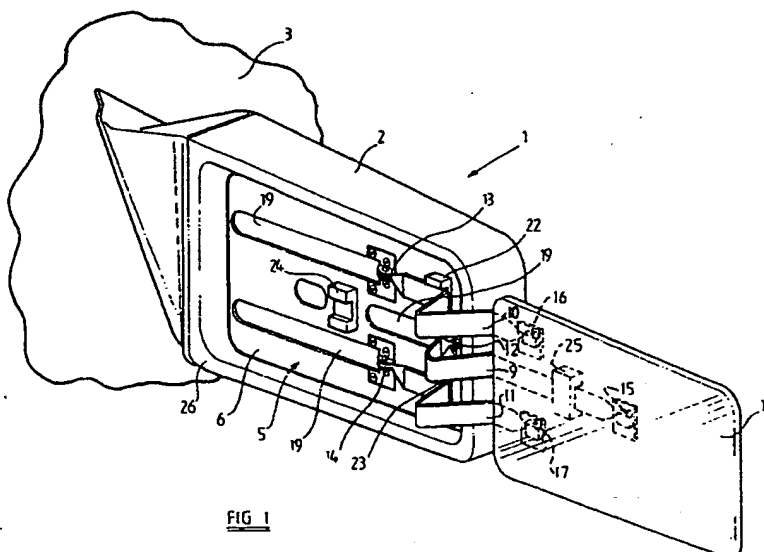


FIG 1

EP 0 385 814 A1

## Mirror Assembly

The present invention relates to a mirror assembly for a motor vehicle, particularly a side mirror commonly mounted on the wing or door frame of the vehicle.

It is conventional practice to use with a vehicle (such as a car) when towing a wide vehicle (such as a caravan) a mirror which is secured to a cantilever arm bolted to the side of the vehicle.

According to this invention there is provided a mirror assembly for a motor vehicle comprising a housing adapted to be secured to the vehicle, and a mirror mounted on the housing for movement relative thereto between a first position and a second position, in which second position the mirror extends at least in part to one side of the housing.

The first position may, in conventional manner, involve the mirror being substantially within the peripheral boundary of a housing for a mirror in which position, ordinarily, a mirror is received, and will be used for driving under normal conditions. The second position will be used to give laterally extended rear visibility such as, for example, when the vehicle is being used to tow a caravan, the presence of which will often partially or totally obscure visibility in a conventionally positioned mirror.

Advantageously means are provided to releasably secure the mirror relative to the mounting in the first and second positions.

Preferably the mirror assembly comprises a mounting assembly secured to the housing for limited movement relative thereto, the mirror being supported by a carrier assembly secured to the mounting assembly, the construction and arrangement being such that the plane of the mirror when in its second position is substantially parallel to the plane of the mirror when in its first position.

Preferably the carrier assembly comprises at least one lever, the or each lever being preferably cranked to permit of pivoting thereof in a manner wherein pivotal movement to the second position is not obstructed by the housing, the mounting assembly having at least one aperture provided therein to permit of reception of the cranked part of the or each lever when the mirror is moved towards the first position.

Alternatively the mirror may be mounted for linear movement between its first and second positions, such as linear movement in a direction substantially parallel to the plane of the mirror.

Thus the mirror may be secured to a mounting, and the mounting may be mounted for linear sliding movement on a track way secured to the housing.

Preferably the mounting is adapted to be se-

cured in the housing in a manner to permit of tilting of the mounting relative to the housing.

Thus, means to effect positional adjustment of the mirror for optimum driver visibility, conventionally afforded by a means within the car to positionally adjust the mounting, will be effective to enable positional adjustment of the mirror when in its extended position.

If desired drive means may be provided to move the mirror between its first and second positions, conveniently electrical or electronic means operable from the interior of the vehicle to which the assembly is to be attached.

According to a second aspect of the invention we provide a mirror assembly comprising a mirror and a mounting to which the mirror is movably attached, the mounting being received within a housing which is adapted for attachment to a panel of a motor vehicle, the mirror being movable relative to the mounting between a first position and a second position in which the mirror extends to a side of the mounting, means being provided to releasably secure the mirror relative to the mounting in the said first and second positions.

Preferably in the first position a face of the mirror lies adjacent to a surface of the mounting to which surface of the mounting the mirror, in the second position, extends substantially parallel, such that, in the first position, at least major parts of the said face of the mirror and the said surface of the mounting are presented towards each other.

According to this invention there is also provided a mirror assembly adapted to be secured to the wing mirror of a vehicle in such a manner as to leave a substantial part at least of the viewing area of the wing mirror unobscured, the mirror assembly providing an additional viewing area extending outwardly of the wing mirror.

Preferably the mirror assembly is adapted to be snap-fitted on to the wing mirror, such as by resilient deformation of (e.g.) plastics material.

Such snap-fitting may however be substituted or supplemented by the use of securing means, such as one or more screw clips.

Preferably the mirror assembly comprises a housing having a first part which is provided with the recess adapted to be positioned over an existing wing mirror from the rear, and a second part extending outwardly from the first when so positioned, which second part carries a supplementary mirror, preferably in a recess defined by the second part.

Thus the housing may be moulded in one piece from plastics material, preferably a thermoplastics material such as polyurethane.

Conveniently where the housing is moulded, a reaction moulding process may be utilised in conjunction with a mould assembly having a replaceable insert, the insert corresponding to the first part of the housing and the remainder of the mould cavity corresponding to the second part. In this manner a range of mirror assemblies, the first parts of which are designed to correspond to a particular design of car wing mirror, the second parts being uniform, may be provided conveniently and relatively inexpensively.

Alternatively however, if desired a two part assembly may be utilised, means, such as interfitting formations, being provided to enable the two parts readily and reliably to be secured together.

Preferably lip portions project short distances over the recess in the first part which are adapted to be engaged by snap-fitting over part at least of the rim of the wing mirror.

Where the mirror assembly is to be utilised with an existing wing mirror having a stem, preferably a slot is provided in the housing which extends from the recess in the first part, in which slot the stem of the wing mirror may be located when the mirror assembly is mounted on the wing mirror.

Preferably means is provided to enable the supplementary mirror to be adjusted independently of the wing mirror. Thus, the supplementary mirror may be mounted on the housing, e.g. in a recess afforded by the second housing part, on a ball and socket joint.

In this manner the existing wing mirror may be adjusted, consequently adjusting the inclination of the supplementary mirror, and subsequently the supplementary mirror may be adjusted to provide the desired range and overlap of rear viewing from the driving seat.

There will now be given detailed descriptions to be read with reference to the accompanying drawings of various embodiments which have been selected for the purposes of illustrating the invention by way of example.

In the accompanying drawings:

FIGURE 1 is a perspective view of a mirror assembly which is a first embodiment of the invention in an extended condition;

FIGURE 2 is a plan view of the mirror assembly depicted in Figure 1 with a part broken away, the broken lines in this Figure indicate the positions of various parts of the assembly when the mirror is in the first, normal position;

FIGURES 3, 4 and 5 are schematic views illustrating a second embodiment, similar to the first embodiment, but in which linear movement is utilised as distinct from pivoting movement;

FIGURE 6 is a front elevation of the mirror assembly which is the third embodiment of the invention;

FIGURE 7 is a plan view of the mirror assembly as shown in Figure 6;

FIGURE 8 is a perspective view showing the mirror assembly which is the third embodiment of the invention secured to the door of a car;

FIGURES 9 and 10 are sectional views of said third embodiment, taken on the lines 9-9 and 10-10 of Figure 6;

FIGURE 11 is a front elevational view of the mirror assembly which is the fourth embodiment of the invention;

FIGURE 12 is also a front view, showing component parts of the fourth embodiment prior to assembly;

FIGURE 13 is a plan view, corresponding to Figure 12; and

FIGURE 14 is a front elevation of the mirror assembly which is the fifth embodiment of the invention.

Referring to the drawings a mirror assembly 1 comprises a housing 2 which is adapted for attachment to a panel of a motor vehicle 3 and which housing 2 provides a cavity 4 in which is movably retained a mounting assembly 5 for a mirror 18.

The mounting assembly 5 comprises a mounting plate 6 which is attached to the housing within the cavity 4 by a ball and socket joint 8 such that the mounting plate 6 may be tilted within the cavity 4 by pivoting of the mounting plate 6 about the ball and socket joint 8.

The mounting plate 6 may be tilted within the cavity 4 of the housing 2 in a conventional manner by mechanically and/or electrically operable means which may be actuated by a person sitting within the vehicle. For example the mounting plate 6 may have rigidly attached thereto a lever which extends to a side of the mounting and which extends through a panel 3 of the vehicle and at an end of which is provided a handle which may be manually actuated by a driver of the vehicle to tilt the mounting plate 6.

Supported by the mounting plate 6 is a carrier assembly 21, comprising in the first embodiment a plurality of cranked levers 9, 19 and 11. Inner end portions of the levers are secured to the mounting plate, on a surface 20 there of which is presented away from the cavity 4, by pivots 12, 13 and 14 whereby the levers may be pivotally moved relative to the mounting plate 6.

The levers 9, 10, 11 are each pivotally connected at their other ends to pivots 15, 16, 17 on a support plate 21 carrying the mirror 18.

Pivotal movement of the levers 9, 10, 11 relative to the mounting plate 6 and support plate 21 causes translatory movement of the mirror 18, as indicated by the chain-dot-lines in Figure 2, between a first position in which the mirror 18 overlies the mounting plate 6 and lies within the peripheral

boundary 26 of the housing 2, i.e. the position of the mirror during normal driving conditions, and a second position in which the mirror extends to one side of the mounting, seen in Figure 1, the levers operating in the manner of a parallel linkage.

The mounting plate 6 is provided with a plurality of securing means 22, 23, 24 which comprise receiving means into which appropriate portions of respective ones of the levers 9, 10, 11 may be releasably snap-engaged in order to restrain pivotal movement of the levers 9, 10, 11 relative to the mounting plate 6, the means 24 securing the lever 9 when the mirror is in its first position and the means 22 and 23 securing the levers 10 and 11 when the mirror is in its second position.

The plate 21 also provides a securing means 25 of the same kind as the securing means 22, 23, 24 into which a portion of the central cranked lever 9 may be releasably snap-engaged to prevent relative movement between the lever 9, and the mirror 18 when the mirror is in its second position.

When the mirror 18 is moved to the second position relative to the mounting plate 6 the levers 10, 11 are snap-engaged into the securing means 22, 23 respectively and the lever 9 is snap-engaged into the securing means 25 in order to secure the mirror 18 substantially parallel relative to the mounting plate 6 and in an extended condition relative to the said mounting plate 6.

In order to move the mirror 18 from the second position to the first position the levers 10, 11 are disengaged from the securing means 22, 23 and the lever 9 is disengaged from the securing means 25 and the levers are pivoted relative to the mounting plate 6 and the mirror 18 until the mirror 18 overlies the mounting plate 6 and lies within the peripheral boundary 26 of the housing 2. The mirror 18 is secured in this position relative to the mounting plate 6 by snap-engagement of the lever 9 in the securing means 24.

The mirror may be moved from the first position to the second position again by disengaging the lever 9 from the securing means 24 and pivoting the levers 9, 10, 11 to move the mirror 18 to one side of the mounting 5 and securing it in the second position as described above. Thus the driver of a vehicle towing (e.g.) a caravan may, by simple movement of the mirror assembly to its second position, be provided with an appropriate rear view of the vehicle, which rear view may be adjusted from within the vehicle in conventional manner.

In the first embodiment if desired movement of the mirror 18 from its first to its second position may be afforded by electrically-operative drive means, conveniently provided by electric motors operative to rotate the levers about their pivotal mountings 12, 13 and 14. In such circumstances, securing

means other than the securing means 22, 23, 24 and 25 described above may be utilised to restrain movement of the cranked levers 9, 10 and 11, other than when being driven by the drive means between their first and second positions, such securing means in such circumstances being afforded by (for example) solenoid locks. The drive means may operate for a timed period, or until a specific overload current is reached, indicating the extreme position of movement of the mirror, or if desired sensing means may be utilised to indicate the arrival of the mirror at one of its terminal positions.

The mounting plate 6 provides a plurality of apertures 19 through which may be inserted the cranked portions of the levers 9, 10, 11 when the mirror 18 approaches and is in the first position relative to the mounting plate 6. In this way, the cranked portions of the levers 9, 10, 11 may be accommodated within the cavity 4 of the housing 2 behind the surface 20 of the mounting plate 6 so that the mirror, when in the first position, will be adjacent to and substantially parallel with the mounting plate 6.

The dashed lines in Figure 2 indicate the positions of various parts of the assembly when the mirror is in the first position.

As the mirror is moved from the first position to the second position the cranked portions of the levers 9, 10, 11 are withdrawn from the cavity 4 through the apertures 19.

The levers 9, 10, 11 are cranked so as to permit pivoting of the mirror 18 relative to the mounting plate 6 in a manner so as not to be obstructed by the protruding peripheral boundary 26 of the housing 2.

An assembly of the kind described may be adapted for insertion into a specific design of conventional mirror housing suitable for a specific model of motor vehicle and it may be used to replace conventional "permanent" mirror assemblies.

Alternatively the whole mirror assembly including the housing may be substituted for a conventional assembly.

The assembly according to the invention is easily replaced in the event of any damage thereto and such an assembly is less likely to sustain serious damage in collisions than certain conventional systems, provided that the housing 2 itself is not struck during the collision, because the mirror, if struck, will tend merely to pivot relative to the mounting 5 as the impact of a collision merely disengages the levers 9, 10, 11 from their respective securing means 25, 22, 23.

A mirror assembly according to the invention also permits of rapid and easy adjustment of the mirror for driving under different conditions.

The mirror assembly which is the second embodiment of this invention (see Figures 3, 4 and 5), in relation to which similar numerals to those used in Figures 1 and 2, with the suffix a, have been utilised, is similar to the first embodiment, but utilises linear sliding movement of the mirror 18a relative to the housing 2a to transfer the mirror from its first position to its second position.

Thus the mounting comprises a mounting plate 6a which is attached to the housing 2a by a ball and socket joint 8a in a manner such that the mounting plate 6a may be tilted within the cavity 4a by pivoting of the mounting plate 6a about the ball and socket joint 8a. The mounting plate 6a may be tilted within the cavity 4a in a conventional manner by mechanical and/or electrically operable means which may be actuated by a person sitting within the vehicle.

The mounting plate 6a is provided, on a surface 20a thereof, with a dovetail formation 10a, on which a carrier assembly comprising a carrier plate 21a is slidably mounted in a width-wise direction (see Figure 4). The mirror 18a is secured to a support plate 21b, said support plate similarly being provided with a dovetail formation, and being slidably mounted on the carrier plate 21a.

In this manner the mirror may be slid in a direction width-wise of the housing 2a from a normal driving position, shown in dotted lines in Figure 3, to a position for towing, shown in full lines in Figures 3 and 5, such movement involving outwardly sliding movement of the carrier plate 21a relative to the housing 6a, and outward sliding movement of the support plate 21a relative to the carrier plate 12a.

Snap-lock means are provided (not shown) for releasably securing the mirror in an extended position relative to the carrier plate 21a, and for securing the carrier plate 21a in its extended position relative to the mounting plate 6a.

Conveniently a part 3a of the casing, adjacent to an outer edge thereof, is hinged to provide an opening in the side wall of the housing 2a to permit movement of the mirror into its towing position, said hinged part being capable of being snap-fitted back into a closed position when the mirror has been returned to its normal position.

As with the first embodiment, movement of the mirror 18a between its first and second position may be effected by electrical or electronic drive means.

In both the first and second embodiments, a security locking system may be provided to prevent undesired movement of the mirror between its first and second positions, such a locking system conveniently being released from the interior of the vehicle to which the assembly is to be attached.

The mirror assembly which is the third embodi-

ment of this invention (see Figure 6) comprises a housing 56 moulded in one piece, conveniently by a reaction moulding process from a material such as polyurethane, the housing comprising two sections, an inner section 56a and an outer section 56b.

The inner section 56a is provided with a recess or cavity 58, around the three sides of which a lip 60 of the housing extends.

Located generally centrally within the cavity 58 is a support means for the rear of the mirror, which may be provided by a block 64, to the outer surface of which a resilient pad 66, (such a foam polyurethane) may be secured.

The second section 56b of the housing is also provided with a cavity 68, within which a supplementary mirror 70 is mounted, by means of a ball and socket joint 72.

In the use of the mirror assembly in extending the viewing range from the driving seat of a vehicle, the mirror assembly is snap-fitted over an existing wing mirror W (Figure 8) from the rear, the lip 60 being temporarily deformed as the mirror W passes into the cavity 58. Where the mirror assembly is to be mounted on an existing mirror which is mounted to the car body by a stem 55, conveniently a slot 62 is provided which extends through the wall of the housing from the cavity 58 through the lip 60, and the stem 55 of the wing mirror 65 located within the slot 62. The size and shape of the mirror assembly is such that, when so mounted on the wing mirror, the pad 66 is deformed, ensuring firm engagement between the lip and the rim of the wing mirror.

When in such a position, as can be seen from Figure 8, the majority of the viewing area of the wing mirror W is unimpeded by the mirror assembly, and may be used as normal. The supplementary mirror 72 provided by the mirror assembly effectively extends the rear view of the driver, and the angle of the mirror 72 may be adjusted on the ball and socket joint 72 as desired.

The forces acting on the mirror assembly during normal driving of the vehicle are insufficient to detach the mirror assembly from the wing mirror. However if the mirror assembly, in its extension outwardly of the vehicle, should be caused accidentally to strike a pedestrian or stationary article, the mirror assembly will tend to twist about a vertical axis passing generally between the first and second housing portions, causing the mirror assembly to become detached from the wing mirror, minimizing damage and possible injury.

The mirror assembly may be removed from the wing mirror when no longer desired to be used, in a similar manner.

The housing 56 is, as has been said moulded in one-piece by the use of a reaction moulding

process, in which conventionally a mixture of reacting components is injected into a mould cavity having the form of the article to be moulded, to react and set therein. Conveniently in the mould assembly utilised for the manufacture of the housing of the first embodiment, an insert member is utilised which at least in part defines the inner section 56a of the housing, that is the housing part which is adapted to be mounted over an existing wing mirror. In this manner by the removal of the insert, and substitution therefor of a different insert, an outer section 56b may be moulded integrally with an inner section 56a of different profile, corresponding to a wing mirror of different design. In this manner a range of mirror assemblies may be produced having identical outer sections, the inner sections of each of which are adapted to be mounted on respective particular designs of existing wing mirror, without the necessity of incurring high mould costs.

Alternatively, as will be appreciated from Figures 11 to 13, in which similar numerals have been used with an apostrophe (') to indicate similar parts, separate inner and outer sections 56a', 56b' may separately be produced, being provided with means, such as interfitting formations, 80 to enable the sections readily to be positioned and secured together.

Whilst in the fourth embodiment housing sections 56a' and 56b' are utilised which are fixedly secured together, in the fifth embodiment illustrated in Figure 14 the outer section 56b is secured to the inner section 56a by a means which permits some degree of relative movement between the outer and inner sections, such as a universal joint system 86, which conveniently permits relative movement of the outer section 56b about a generally horizontal axis passing through the joint system 86, and conveniently also about a generally vertical axis passing through the joint system.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, or a class or group of substances or compositions, as appropriate, may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

## Claims

1. A mirror assembly for a motor vehicle comprising a housing (2) adapted to be secured to the vehicle, and a mirror (18) mounted on the housing for movement relative thereto between a first position and a second position in which second position

the mirror extends at least in part to one side of the housing.

2. A mirror assembly according to Claim 1 comprising a mounting assembly (5) secured to the housing for limited pivotal movement relative thereto, the mirror (18) being supported by a carrier assembly (21) secured to the mounting assembly (5), the construction and arrangement being such that the plane of the mirror when in its second position is substantially parallel to the plane of the mirror when in its first position.

3. A mirror assembly according to Claim 2 wherein the carrier assembly comprises at least one lever (9, 10, 11), the or each lever having pivotal connection at one end thereof to the mirror and at the other end to the mounting assembly means (22, 23, 24) being provided to restrain movement of the mirror when the mirror is in either the first or second position.

4. An assembly according to Claim 3 in which the or each lever (22, 23, 24) is cranked to permit the pivoting thereof in a manner wherein pivotal movement to the second position is not obstructed by the housing (2), the mounting assembly having at least one aperture (19) provided therein to permit of reception of the cranked part of the or each lever when the mirror is moved towards the first position.

5. An assembly according to one of Claims 1 and 2 wherein the mirror is mounted for linear movement between its first and second positions.

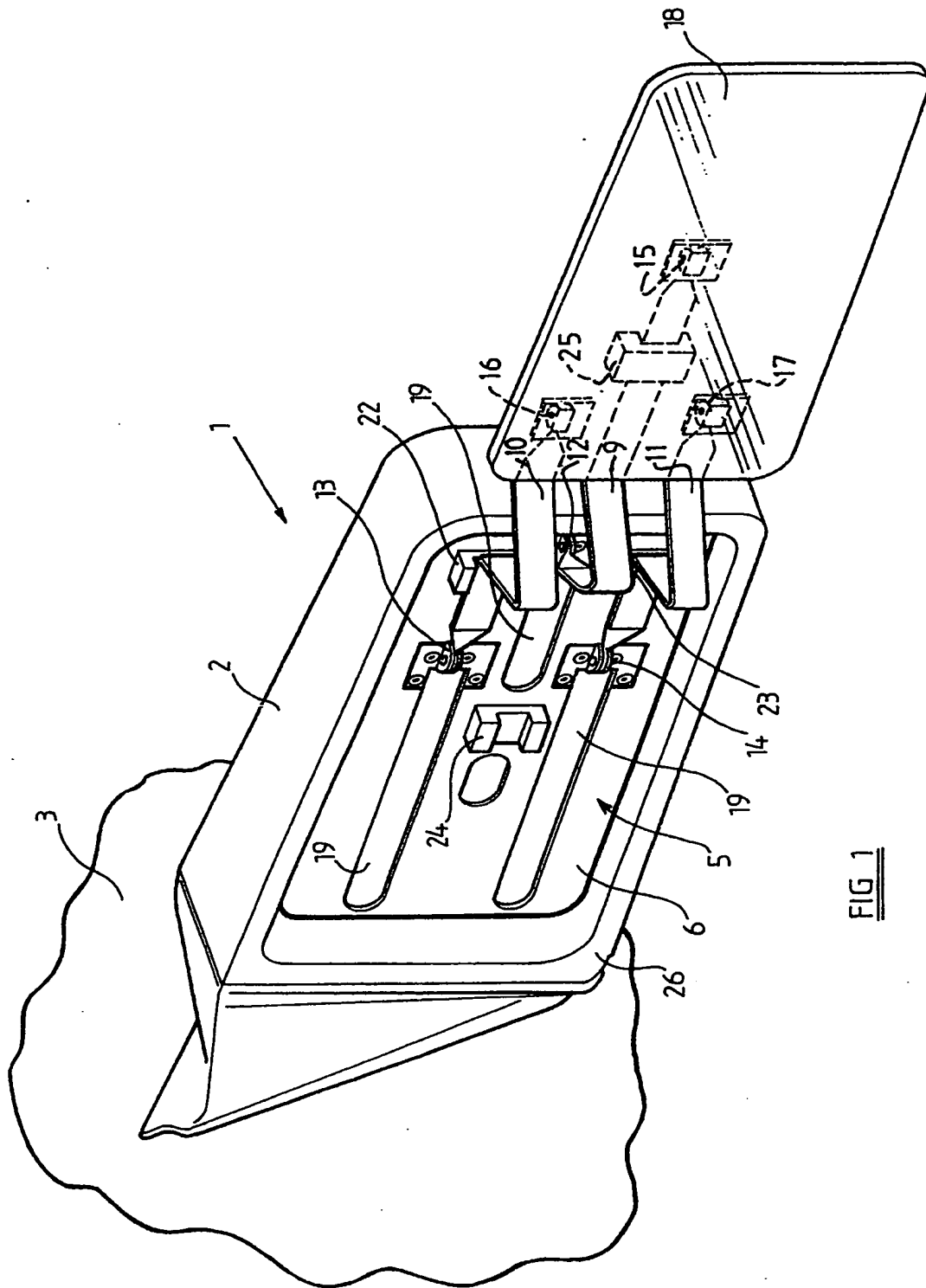
6. An assembly according to any one of the preceding claims comprising drive means to move the mirror between its first and second positions.

7. A mirror assembly (56) adapted to be secured to the wing mirror (W) of a vehicle in such a manner as to leave a substantial part at least of the viewing area of the wing mirror unobscured, the mirror assembly providing an additional viewing area (70) extending outwardly of the wing mirror.

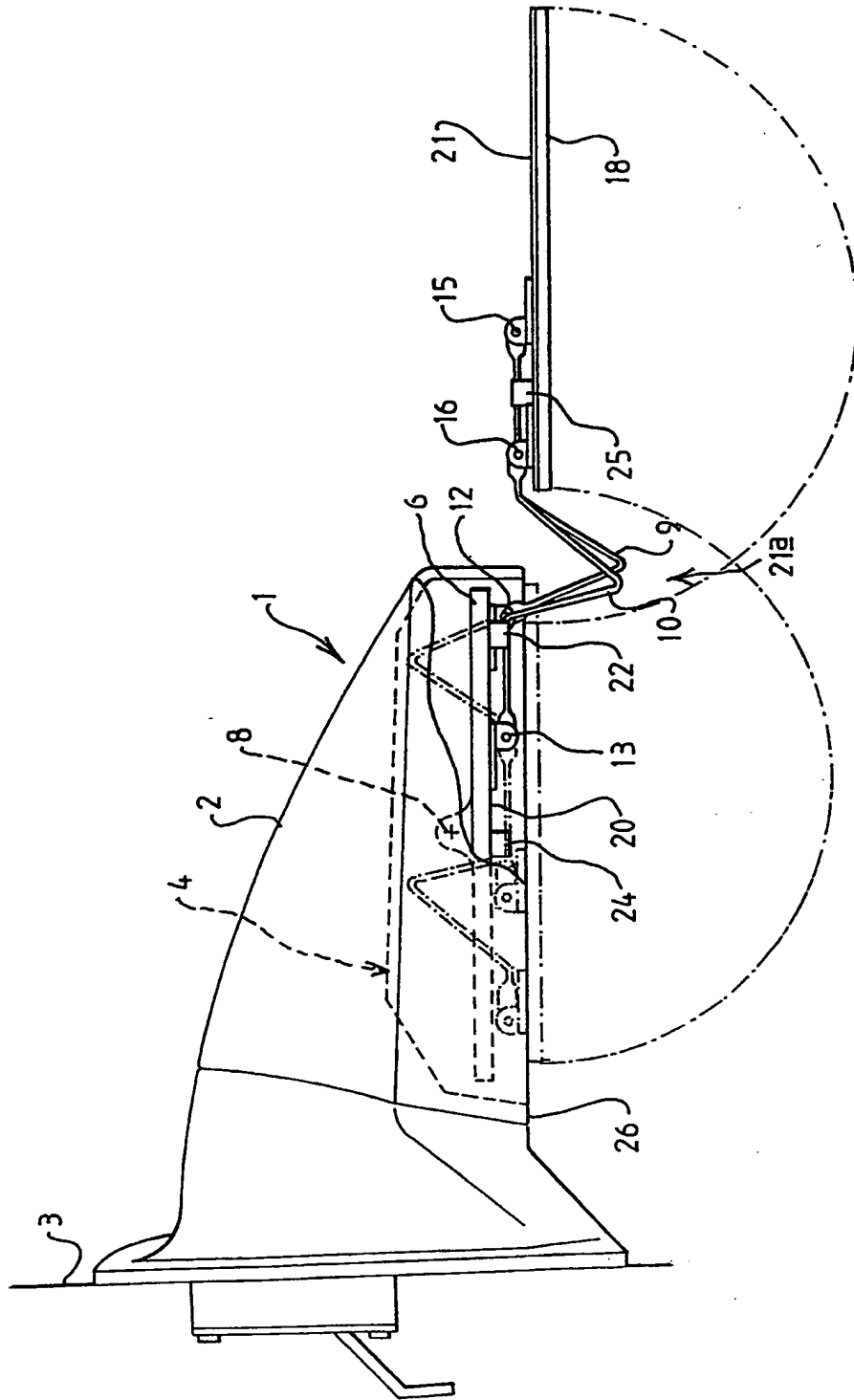
8. A mirror assembly according to Claim 7 comprising a housing (56) having a first part (56a) which is provided with a recess adapted to be positioned over an existing wing mirror from the rear, and a second part (56b) extending outwardly from the first part when so positioned, which second part carries a supplementary mirror (70).

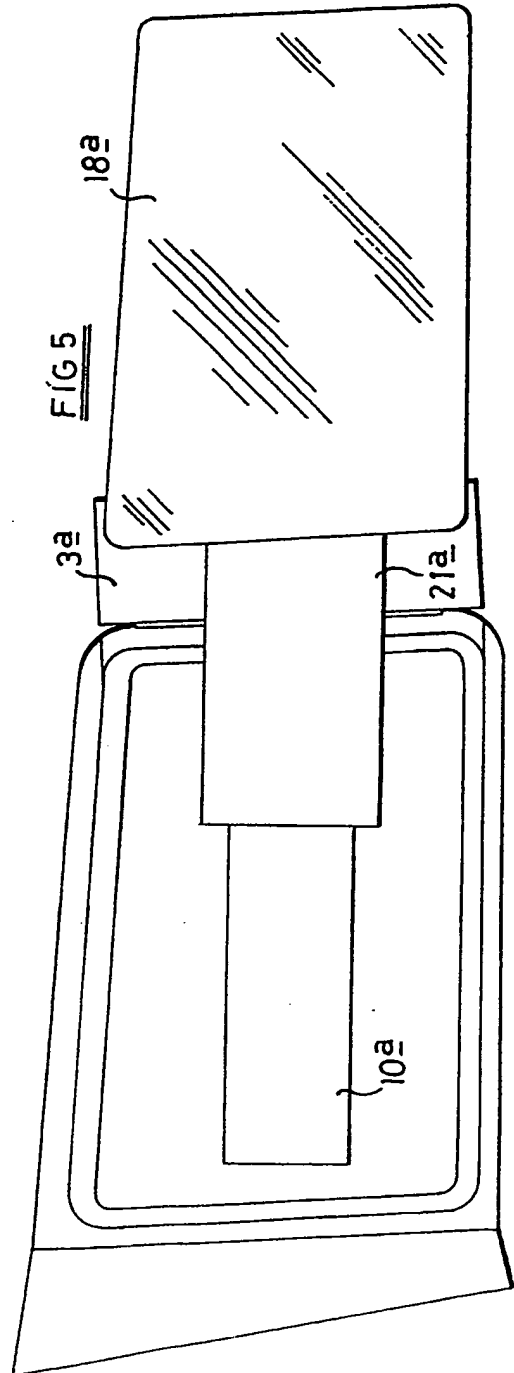
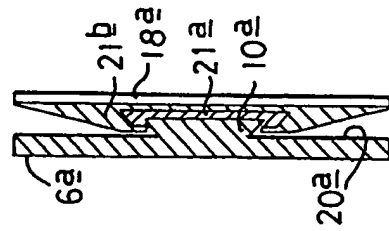
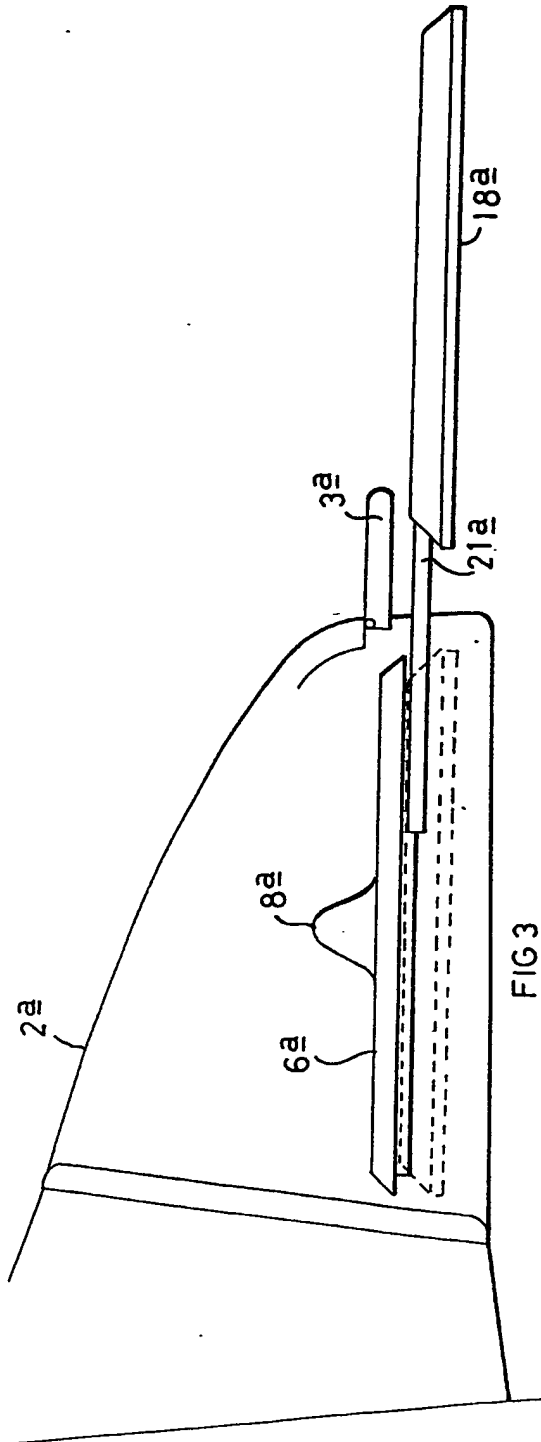
9. A mirror assembly according to one of Claims 16 and 17 wherein the housing is a two-part assembly, means (80, 86) being provided to enable the two parts readily and reliably to be secured together.

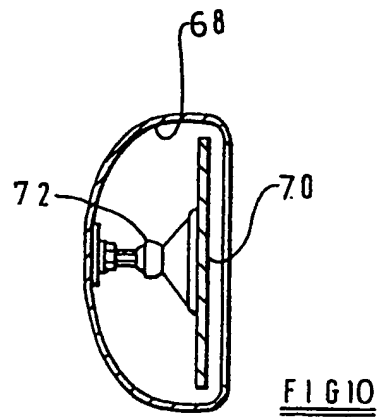
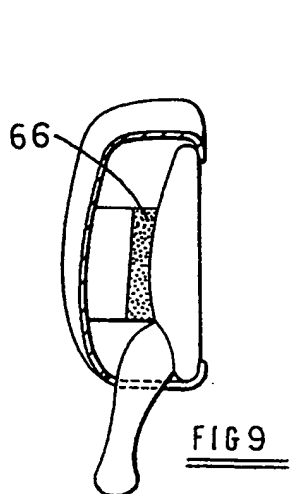
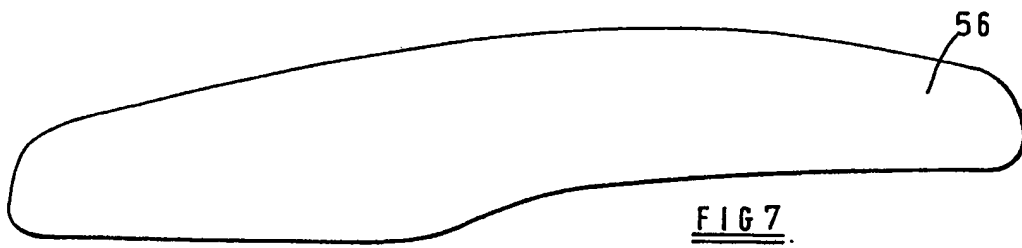
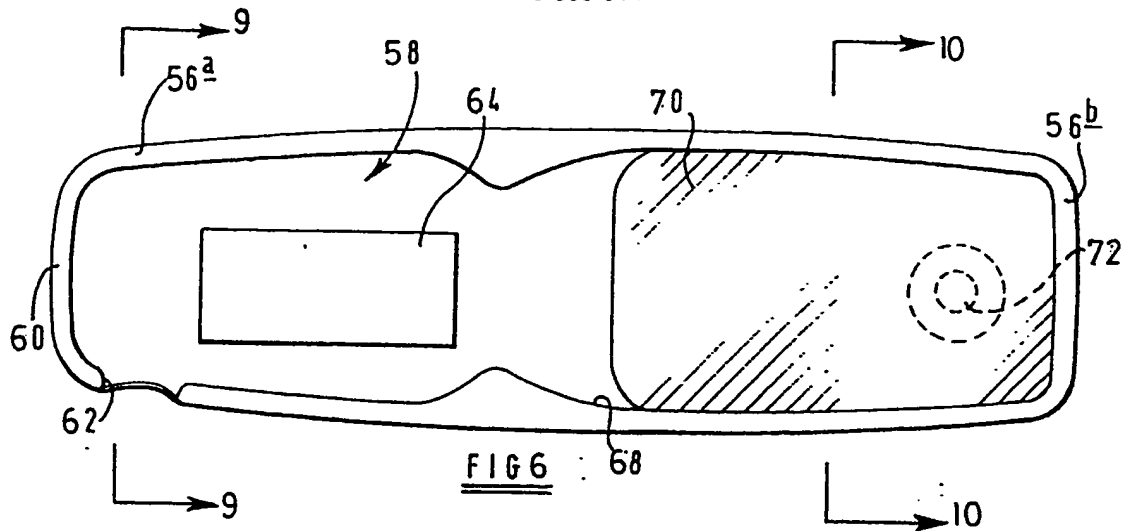
10. A mirror assembly according to any one of Claims 7, 8 and 9 wherein means is provided to enable the supplementary mirror to be adjusted independently of the wing mirror.











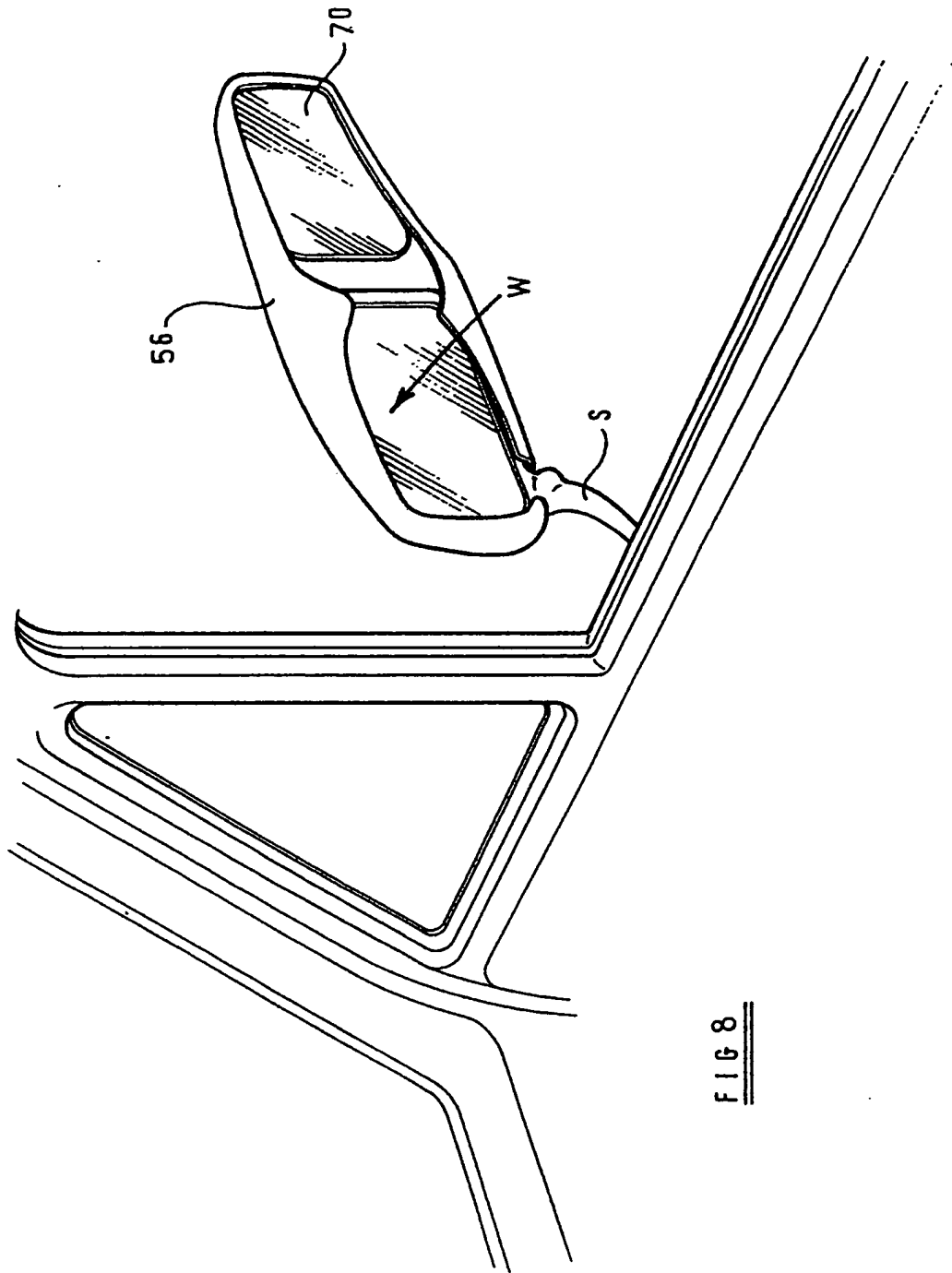


FIG 8

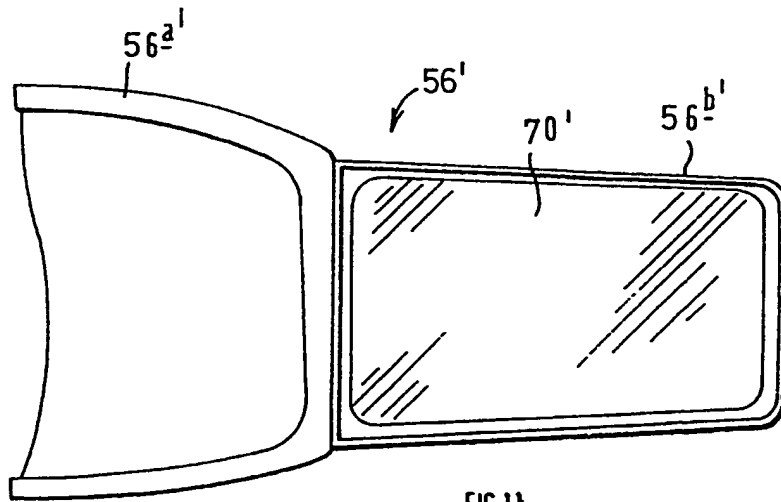


FIG 11

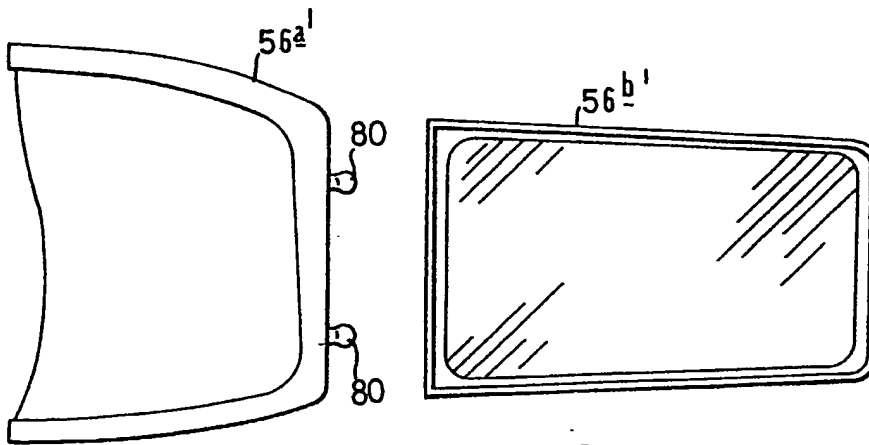


FIG 12

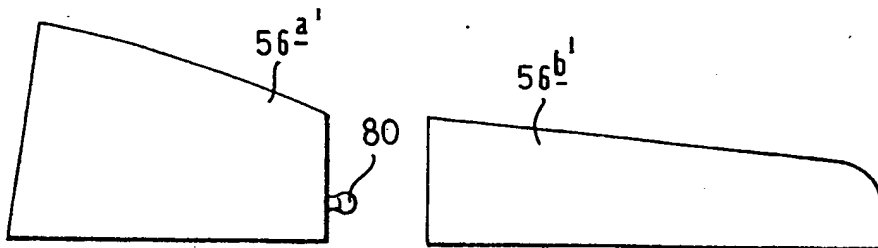


FIG 13

